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(54) Capacitive key input unit and method of operating same

(57) A capacitive substantially transparent or translucent key board panel, e.g. for computer input comprises a base panel 14 an input electrode  $X_{nm}$  and an output electrode  $Y_{nm}$  for each key location, and a surface layer 18. The key board panel is constructed so that data on a data sheet to be placed thereunder can be seen through it so that the key input operation can be carried out directly by corresponding the key coordinates of the key board panel to the datum of the data sheet. The key input is carried out by bringing a separate conductive body 40 closer to or into contact with the corresponding key coordinates, whereby the respective input electrode is capacitively coupled through the conductive body

to the respective output electrode and the necessary output from the input electrode is taken from the output electrode.

FIG.2

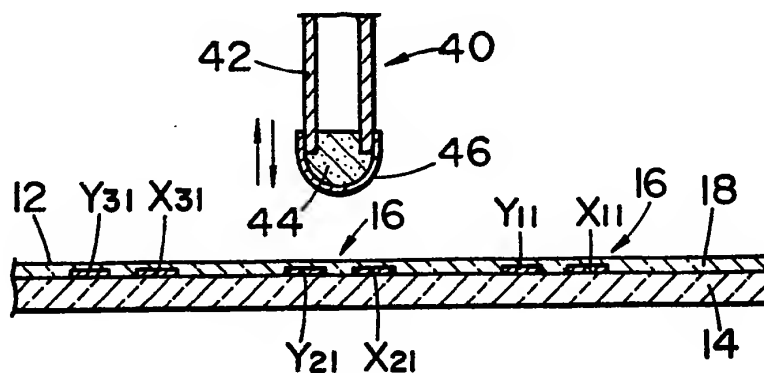
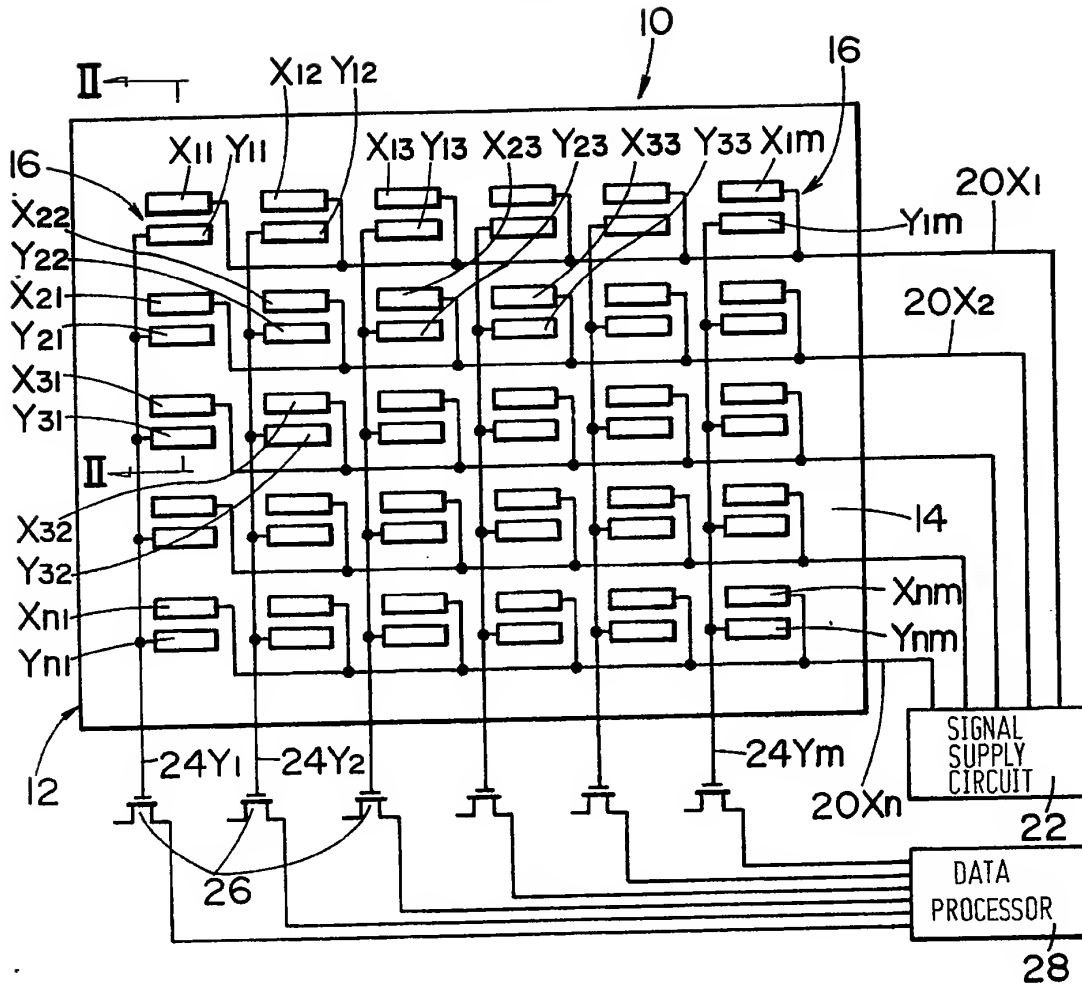




FIG.1



**FIG.2**

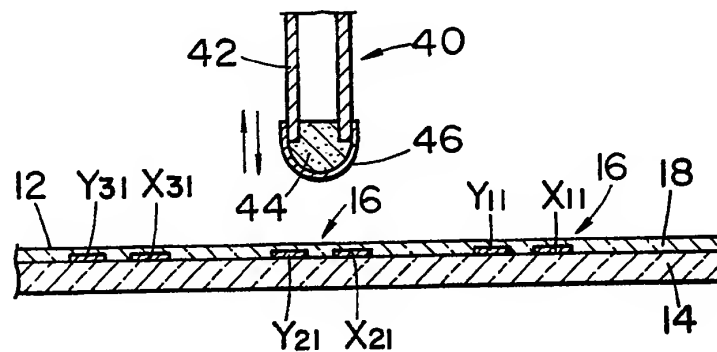




FIG.3

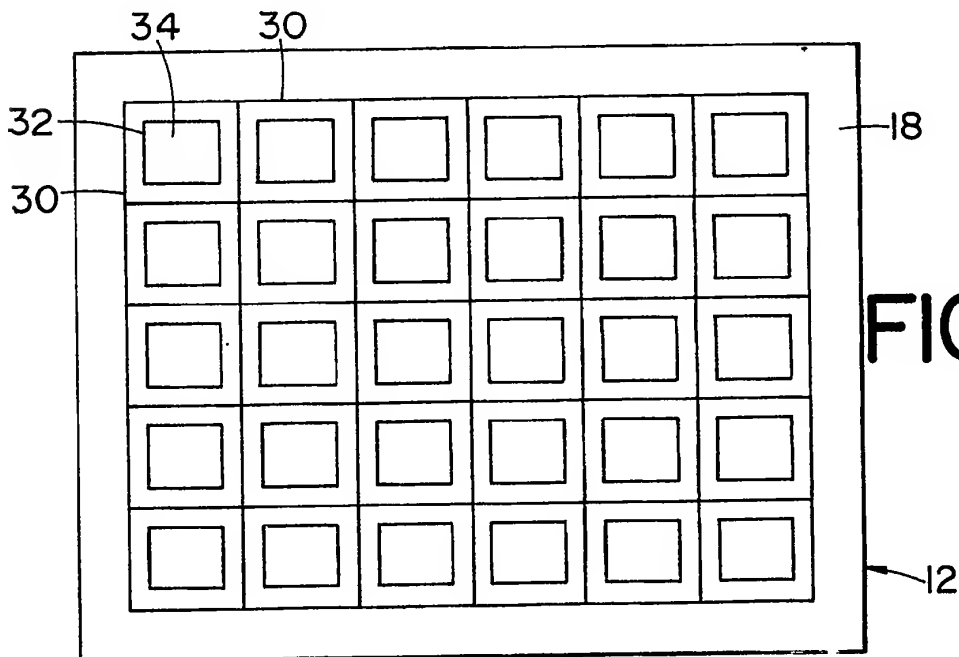
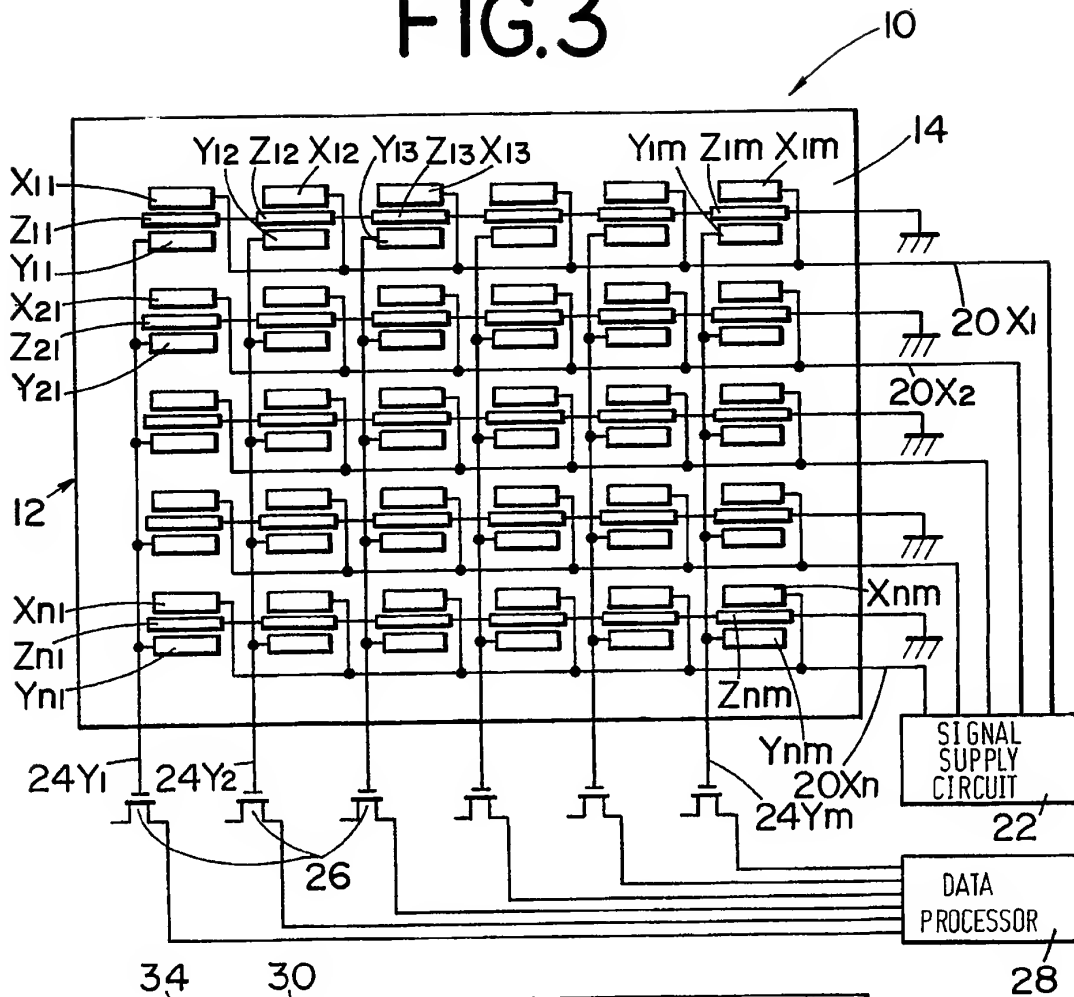


FIG.4



## SPECIFICATION

### Capacitive key input unit and method of operating same

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#### BACKGROUND OF THE INVENTION

##### 1. Field of the Invention

10 The present invention relates to a capacitive key input unit and a method of operating the capacitive key input unit. The unit is adaptable particularly to and appropriate to input data into computers, office management devices and other information or business data processors.

##### 2. Description of the Prior Art

15 In office management devices or computers which are used for sales management, inventory management, personnel management, hospital business management and other purposes, data which are frequently employed such as items of goods, names of clients and consumers or personnel, unit costs, salaries or the like are recorded on a card or a roll sheet and data input is carried out by placing such a card or roll sheet over the key board or a key input unit in such a manner that individual data on a data sheet or key word list correspond to the respective keys of the key board one by one.

20 Key boards of key input units which have heretofore been generally used are made of opaque material and/or in opaque manner. Accordingly, a system is such that a data sheet is placed on the key input division of a key board or key coordinates. In this system, drive energy such as magnetic flux, electric field or supersonic waves which can pass through the data sheet is required because a key is operated through the data sheet. It is also necessary to use a special operating device such as a magnetic pen, a high-frequency pen or a supersonic pen. The use of the drive energy, however, causes a problem that noises tend to be generated because the drive energy passing through the data sheet is also input in a key adjacent to the key operated. Another system involves a so-called key mat having openings or windows in a data sheet corresponding to the respective keys. This key mat is arranged so as to have information on data on portions of the data sheet adjacent to the respective openings or windows and placed on the key board in such a manner that the openings or windows correspond to the respective keys. Accordingly, in this case, operation is carried out by pressing a key adjacent to the necessary information corresponding to the datum on the key mat or data sheet. A key input unit of this kind is currently of a large size such that it is mainly arranged in office so that no big inconvenience is caused or realized. However, in future, consideration will be claimed over a

key input unit of a compact or portable size which can be used by persons while they are sitting before their own desks in office or by salesmen on site where they take orders from their clients. In this case, it should be noted that a key input unit cannot be rendered of a large size and should be compact enough to amount to no large space in businessmen's own desks or to be carried in a briefcase or the like by people. If the key mat as above mentioned would be employed, such a key input unit will correspondingly become big and it would not be rendered so small and compact as it can be equipped or installed in each of businessmen's own desks or carried over by people as routine business equipment.

25 In order to erase or correct information represented on a Braun tube type display device, there has been heretofore used a procedure in which a light pen is brought into contact with a portion of the information to be erased or corrected on the Braun tube thereof. In this case, a light sensing element provided on the tip portion of the light pen senses the light representing the location of the involved information or the location of coordinates and the signal obtained by the sensing of the light is fed from the light pen to the light source scanning unit of the Braun tube type display device, whereby the information indicated by the light pen on the Braun tube thereof is distinguished over other information.

30 In a Braun tube type display device of this kind, a long electric code or wire is connected to the light pen in order to feed signals from the light pen to the light source scanning unit of the display device. The wire connected to the light pen causes various problems in operation.

35 The light pen also presents disadvantages that it is applicable only to Braun tubes or the like in which light is scanned in succession or in turn according to time schedule and it cannot be applied to cases where individual coordinates are turned on and off simultaneously or where no light is generated. Accordingly, the light pen as mentioned hereinabove cannot be generally applied to a display unit of the diode luminescence type or of the liquid crystal type. It may be possible to apply the light pen to the diode luminescence type or the liquid crystal type if it is arranged so as to cause the location of coordinates generate lights in succession or in turn according to time schedule. The technique, however, is not practically applicable because an intensity of instantaneous illumination of each of locations of coordinates is required to be rendered high as a lightening-up time of each of the locations of coordinates is divided according to the total number of locations of coordinates.

#### SUMMARY OF THE INVENTION

40 Therefore, an object of the present invention is to provide a capacitive key input unit



and a method of operating the unit, which can render the key board panel compact or of small size even if the number of locations of key coordinates is large.

5 Another object of the present invention is to provide a capacitive key input unit and a method of operating the unit, which can be constructed so as to render the structure simple and the thickness thin.

10 A further object of the present invention is to provide a capacitive key input unit and a method of operating the unit, which causes no or less risk of causing any input into location of key coordinates adjacent to the location of key coordinates to be input.

15 A still further object of the present invention is to provide a capacitive key input unit and a method of operating the unit, which can produce information on the location of coordinates in the display division of a display device of the type such as of the Braun tube type, of the diode luminescence type or of the liquid crystal type.

20 A still further object of the present invention is to provide a capacitive key input unit and a method of operating the unit which does not require a special operation device such as a magnetic pen, a high-frequency pen or a supersonic pen or any operating device with a wire and which can be operated merely by means of a separate simple conductive element.

25 A still further object of the present invention is to provide a capacitive key input device and a method of operating the unit which does not require to press the key board panel at the time of operation, thereby rendering the unit highly durable.

30 Various other objects, advantages and features of the present invention will become readily apparent during the course of the ensuring detailed description of the specification, and novel features will be particularly pointed out in the appended claims.

#### 45 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagrammatical top plan view illustrating one embodiment of the capacitive key input unit in accordance with the present invention in which the surface layer is omitted.

Figure 2 is an enlarged cross sectional view taken along the line II-II of Fig. 1 in which the surface layer is not omitted.

55 Figure 3 is a diagrammatical top plan view illustrating another embodiment of the capacitive key input unit in accordance with the present invention in which the surface layer is omitted.

60 Figure 4 is a diagrammatical top plan view illustrating a variation of the surface layer in use for the capacitive key input unit in accordance with the present invention.

#### 65 DETAILED DESCRIPTION OF THE PRE-

#### FERRED EMBODIMENTS

Referring first to Figs. 1 and 2 illustrating one preferred embodiment of the capacitive key input unit in accordance with the present invention, the capacitive key input unit 10 contains a key board panel 12 which comprises a base panel member 14, a plurality of coordinate electrodes generally referred to as 16, and a surface layer 18.

75 The base panel member 14 may be constructed such that the coordinate electrodes 16 are disposed or deposited thereon. The base panel member 14 may be of a substantially transparent or translucent dielectric material which may be of the hard type or of the soft type. The dielectric material of the hard type may be an acrylic resin or glass and the dielectric material of the soft type may be a polyolefin, polyester, polyvinyl chloride, a fluorine-containing resin or a rubber. The base panel member 14 may have a thickness ranging generally from, for example, about one to ten millimeters although it is not restricted to a particular thickness and it may be varied in accordance with use of the capacitive key input unit, and the like. For example, it may be as thick as the surface layer 18 to be disposed or provided on the upper surface of the base panel on which the coordinate electrodes 16 in turn are disposed or deposited.

80 The coordinated electrodes 16 may comprise at least a pair of an input electrode generally referred to also as  $X_{nm}$  and an output electrode generally referred to also as  $Y_{nm}$ . In the reference symbols  $X_{nm}$  and  $Y_{nm}$ , the reference symbol  $n$  is intended herein to refer to the ordinal number of files or ranks of the input or output electrodes arranged side by side or one behind another in rows or lines and the reference symbol  $m$  is intended herein to refer to the ordinal number of files or ranks of the input or output electrodes arranged side by side or one behind another in rows or lines.

110 The coordinate electrodes 16 are provided in number corresponding to the number of key coordinates required for the key board panel 12 of the capacitive key input unit in accordance with the present invention. The coordinate electrodes 16 are constructed such that each of the coordinate electrodes 16 is arranged widthwise side by side in rows or in files and at the same time each of them is arranged lengthwise one behind another in rows or in ranks. In other words, it may be seen that the coordinate electrodes 16 are arranged just like a checkerboard.

120 As best shown in Fig. 1, each of the coordinate electrodes 16 may be composed of a combination of pairs of the input electrodes  $X_{nm}$  and the output electrodes  $Y_{nm}$ . The input and output electrodes may be of a substantially transparent or translucent conductive material such as a metal oxide, e.g., indium oxide-tin oxide (ITO) or tin oxide-antimony



oxide. They may be in any appropriate shape although they are preferably in a rectangular form having a size, for example,  $1 \times 3$  mm,  $1.5 \times 6$  mm,  $2 \times 5$  mm or  $2.5 \times 5$  mm.

5 It is preferred that the input electrodes are substantially identical in size to the output electrodes. Both the input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively, are disposed or deposited on the upper surface of the base  
10 panel member 14 in a thin film form, for example, by means of vapor deposition technique. The thickness of the input and output electrodes may be as thick as from about 500 to about 2,000 Angstroms and, preferably,  
15 about 1,000 Angstroms.

A pair of the input electrode  $X_{nm}$  and the output electrode  $Y_{nm}$  are disposed or deposited such that the input electrode  $X_{nm}$  is placed facing against or parallel to the output electrode  $Y_{nm}$  in an area where the respective  
20 coordinate electrode 16 or key coordinates is located. It may be noted that an input electrode may be arranged side by side or one behind another with the adjacent input electrode in an adjacent key coordinate and an  
25 output electrode may be likewise arranged side by side or one behind another with the adjacent input electrode of an adjacent key coordinate. More specifically, where the input electrodes  $X_{nm}$  are arranged above and parallel  
30 to the respective output electrodes  $Y_{nm}$  as shown in Fig. 1, for example, the input electrode  $X_{22}$  is arranged side by side with both the input electrodes  $X_{21}$  and  $X_{23}$  and, at the same time, one behind another with both the  
35 output electrodes  $Y_{12}$  and  $Y_{22}$ . Similarly, the respective output electrode  $Y_{22}$  is arranged side by side with both the output electrodes  $Y_{21}$  and  $Y_{23}$  and also one behind another with both the input electrodes  $X_{22}$  and  $X_{32}$ . It is of  
40 course apparently appreciated that, where a key coordinates is located at the outermost side of a set of the key coordinates, for example, the input electrode  $X_{11}$  on the one hand is arranged side by side with the input  
45 electrode  $X_{12}$  alone and one behind another with and parallel to the output electrode  $Y_{11}$  and the output electrode  $Y_{11}$  on the other hand is interposed parallel to and between the input electrodes  $X_{11}$  and  $X_{21}$  and arranged side  
50 by side with the output electrode  $Y_{12}$ . Similarly, the input electrode  $X_{12}$  on the one hand is arranged side by side with and interposed between the input electrodes  $X_{11}$  and  $X_{13}$  and also arranged above the respective output  
55 electrode  $Y_{12}$  which, on the other hand, is in turn arranged side by side with and interposed between the output electrodes  $Y_{11}$  and  $Y_{13}$  and further arranged one behind another with and interposed between the input elec-  
60 trodes  $X_{12}$  and  $X_{32}$ . It will be apparent that all the input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively, may be arranged in substantially the same manner as hereinabove set forth. It  
65 is also to be noted that any variation and

modification in arrangement of the input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively, is possible.

The input electrode  $X_{nm}$  and the respective  
70 output electrode  $Y_{nm}$  in the identical coordinate electrode 16 are arranged or disposed in a relationship spaced in a distance ranging generally from about 0.25 to about 1.5 millimeters and, preferably, about 0.75 millimeter  
75 although the distance therebetween is not restricted to any particular one and it may be varied in accordance with the size and number of the coordinate electrode 16 and the like. Distances among one coordinate electrode  
80 and adjacent coordinate electrodes are not restricted to particular ones and may be varied with the size of the base panel member and the number of the key coordinates.

As best shown in Fig. 2, the base panel  
85 member 14 on which the input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively, are disposed or deposited is coated or covered with the surface layer 18 so as to allow its one-side surface to adhere to the whole surface areas  
90 of the input and output electrodes as well as the base panel member with the exterior surface thereof kept open. The surface layer 18 may be of a substantially transparent or translucent dielectric material of the soft type as  
95 hereinabove referred to with respect to the base panel member 14. The surface layer 18 may be provided in conventional manner in the form of a thin film or layer having a thickness ranging generally from about 1 to  
100 about 30 microns and, preferably, from about 2 to about 20 microns.

Referring back to Fig. 1, the input electrodes  $X_{nm}$  are connected electrically to a signal supply circuit 22 through input signal  
105 lines generally referred to as  $20X_n$  in which the reference symbol  $n$  is intended herein to refer to the ordinal number of files or ranks of the input electrodes arranged side by side or one behind another with each other in series in  
110 rows. More specifically, the input electrodes  $X_{11}$ ,  $X_{12}$ , ...,  $X_{1m}$ , i.e., those arranged side by side or one behind another in a series in a row or line in the first file or rank are connected electrically each to a common input  
115 signal line  $20X_1$ . Similarly, the input electrodes  $X_{21}$ ,  $X_{22}$ , ...,  $X_{2m}$ , i.e., those so arranged as above in the second file or rank are connected electrically to a common input signal line  $20X_2$ . All the other input electrodes  
120  $X_{nm}$  are connected electrically in substantially the same manner as hereinabove mentioned to the respective input signal line  $20X_n$ . The signal supply circuit is constructed such that it can supply an identical signal pulse to the  
125 input electrodes  $X_{nm}$  in the identical file or rank through the respective common input signal line  $20X_n$  and also supply a different signal to those belonging to the respective different file or rank through the respective  
130 common input signal line  $20X_n$ .



Similarly, the output electrodes  $Y_{nm}$ , on the other hand, are connected electrically to an impedance converter 26 and then a data processor 28 through output signal lines  $24Y_m$  in which the reference  $m$  is intended herein to refer to the ordinal number of files or ranks of the output electrodes  $Y_{nm}$  arranged side by side or one behind another with each other in series in rows or lines. As shown in Fig. 1, the output electrodes  $Y_{11}, Y_{21}, \dots, Y_{n1}$ , i.e., those arranged side by side or one behind another with each other in a row in the first file or rank are connected electrically each to a common output signal line  $24Y_1$ . The output electrodes  $Y_{12}, Y_{22}, \dots, Y_{n2}$ , i.e., those so arranged as above in the second file or rank are connected electrically to a common output signal line  $24Y_2$  in the same manner as immediately hereinabove. Thus, all the other output electrodes  $16Y_{nm}$  can be connected in the same manner as above through the respectively common output signal line  $24Y_m$  which in turn is connected electrically to each of the impedance converters 26 and then to the common data processor 28. The impedance converter 26 may be composed of field effect transistors (FET) connected to gates thereof and the data processor 28 may be a computer.

Referring now to Fig. 3 illustrating another preferred embodiment of the capacitive key input unit in accordance with the present invention, this example is substantially the same as that shown in Figs. 1 and 2 with the exception that earth electrodes generally reference to as  $Z_{nm}$  are used in addition to the input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively. In the description which follows with respect to the structure and feature as shown in Fig. 3, the common parts and portions are indicated by the same reference numerals and symbols as those shown in Figs. 1 and 2 and duplication of explanation thereon is avoided as long as situation permits.

As shown in Fig. 3, the earth electrodes  $Z_{nm}$  are arranged so as to function as shield electrodes between the respective input electrodes  $X_{nm}$  and output electrodes  $Y_{nm}$ . The earth electrodes  $Z_{nm}$  may be of the same material as that used for the respective input and output electrodes  $X_{nm}$  and  $Y_{nm}$  and may be disposed or deposited in substantially the same manner as the input and output electrodes are disposed or deposited. They may also be in any appropriate shape or form although they are preferably in a rectangular form in size a little bit larger in length than the input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively. The earth electrodes  $X_{nm}$  may be arranged between and parallel to the respective input and output electrodes  $X_{nm}$  and  $Y_{nm}$  in a substantially equal relationship spaced therefrom. More specifically, the earth electrode  $Z_{11}$  is arranged and interposed between and parallel to the respec-

tive input electrode  $X_{11}$  and output electrode  $Y_{11}$ . Similarly, the earth electrode  $Z_{12}$  is arranged and interposed between and parallel to the respective input electrode  $X_{12}$  and output electrode  $Y_{12}$ . All the other earth electrodes  $Z_{nm}$  which are arranged side by side or one behind another in a series in a row without any interruption or interference between mutually adjacent earth electrodes  $Z_{nm}$  are connected to each other and then grounded. It is to be noted, however, that the provision of the earth electrodes  $Z_{nm}$  is not necessarily required where a distance between the respective input electrode  $X_{nm}$  and output electrode  $Y_{nm}$  is large enough or the voltage of a signal pulse to be supplied to the input electrode  $X_{nm}$  is low enough to provide a complete insulation between the corresponding input and output electrodes  $X_{nm}$  and  $Y_{nm}$ , respectively. Although the key board panel 12 which may be employed for the capacitive key input unit in accordance with the present invention are described hereinabove as being composed all of substantially transparent or translucent material, it should be understood that the key board panel 12 may be substantially transparent or translucent enough, when taken as a whole, to see through indications or representations of the data information on a data sheet (not shown) or any other appropriate means through the key board panel 12 placed or attached over or above the data sheet 12 or other means. There may be cases, accordingly, that it is difficult to register the location or position of the key coordinates corresponding to the respective data information through the key board panel 12 or to specify or identify the location or position of the key coordinates on the data sheet or other appropriate means. In order to overcome these defects, there may be various proposals to be adopted for the capacitive key input unit in accordance with the present invention. In this case, it may be noted that any means for overcoming the defects as hereinabove mentioned is provided for the purpose and with the attempt that the coordinate electrodes 16 of the key board panel 12 can be placed so as to locate the key coordinates to be input corresponding to the data sheet or other appropriate means.

Fig. 4 illustrates one example for the means to solve the defects in which lines 30 are drawn for indication or representation on the surface layer 18 of the key board panel 12 just like a checkerboard as enclosing each of the key coordinates in divisions 32 formed by the lines, which may be in any shape such as square or rectangular shape. Other examples may be that the above divisions may be subdivided with lines into subdivisions 34 as enclosing areas of the divisions 32 so as to correspond in area to the respective input and output electrodes  $X_{nm}$  and  $Y_{nm}$  or lines may be drawn underneath so as to indicate or repre-



sent the locations or positions of the key coordinates on the data sheet or other appropriate means. As further means for identifying or specifying the locations or positions of the key coordinates there may be provided marks in pale or light color such as black, red, blue or white which may be printed or attached on the surface layer 18 of the key board panel 12 as corresponding to the locations or positions of the data information or key coordinates of the data sheet or other appropriate means, or the areas corresponding to the subdivisions 34 may be colored with pale or light color such as red, orange, blue or green to such an extent that the indications or representations of the key coordinates on the data sheet or other means can be read through the key board panel 12.

Turning now back to Fig. 2, mention will be made of the operation of the capacitive key input unit having the key board panel 12 as hereinabove set forth in accordance with the present invention. The key board panel 12 contains the coordinate electrodes 16 arranged and constructed so as to correspond in location or position to information on data required to be input to the capacitive key input unit 10. The data sheet is placed or inserted below the key board panel 12 so as to have the key coordinates correspond in position to the respective data information of the data sheet. The necessary data information of the data sheet to be input is read through the key board panel 12. In addition to the data sheet, there may be used a card having a size as substantially wide as the area of the key board panel 12 or a roll sheet wound upon a pair of rolls or any other means which may be employed for this purpose. For example, the display division of a display device which may be of the Braun tube type, diode luminescence type, liquid crystal type, electroluminescence type or fluorescent screen type may also be employed. Where the display device of the Braun tube type is used, the capacitive key input unit in accordance with the present invention may be disposed on or attached to the display division thereof. In this case, the base panel member 14 of the key board panel 12 is not necessarily required and the display plate of the display division thereof can also function as the base panel member 14.

Referring further to Fig. 2, the input may be carried out by bringing an operation device or means closer to or into contact with the surface layer 18 corresponding to the coordinate electrode 16 or key coordinates corresponding to the necessary data information which can be read through the key board panel 12 from the data sheet or any other appropriate means carrying indications or representations on the data information. As the necessary data information is read through the

key board panel 12, materials constituting the key board panel 12 can be chosen so as to keep the key board panel 12 as a whole substantially transparent or translucent

enough to see through data information on the data sheet or the like. The operation device or means may be an operation rod 40 having the structure as shown in Fig. 2. Thus, the operation rod 40 is constructed so as to contain a cylindrical body 42 of, for example, an insulative material with an elastic material provided at one end portion thereof, the elastic material being selected, for example, from a foam such as a polyurethane foam. The end portion 44 may further be covered with a conductive layer 46 such as a foil of a metal such as aluminum. The operation device or means such as the operation rod 40 does not require any wire connected thereto. It may be noted herein that the operation device or means is so required as to couple capacitively the input electrode  $X_{nm}$  to the respective output electrode  $Y_{nm}$ . Accordingly, any device or means which may function in such a manner as hereinabove mentioned can be used for this purpose. For example, an aluminum foil or any other appropriate material may be employed for this purpose merely by wrapping the finger of an operator with the aluminum foil or other material.

As the operation means is brought closer to or into contact with the surface layer 18 of the coordinate electrode 16, the respective input electrode  $X_{nm}$  is capacitively coupled to the respective output electrode  $Y_{nm}$  through the conductive layer 44 of the operational rod 40 or any other conductive material of the other operational means. Accordingly, a signal pulse supplied to the input electrode  $X_{nm}$  of the corresponding coordinate electrode 16 through the respective input signal line  $20X_n$  from the signal supply circuit 22 is then output through the capacitive coupling to the respective output electrode  $Y_{nm}$ . The output signal is then supplied through the output signal line  $24Y_m$  connected to the respective output electrode  $Y_{nm}$  to the corresponding impedance converter 26 for carrying out impedance conversion of the output signal and further to the data processor 28. The data processor 28 is constructed so as to distinguish the type of the input signal pulse supplied and the output signal line that carries the output signal and determine the location of the key coordinate or the coordinate electrode 16 from which the input signal is input.

#### CLAIMS

1. A capacitive key input unit containing a key board panel comprising:
  - a base panel member of a substantially transparent or translucent dielectric material;
  - a plurality of coordinate electrodes disposed or deposited on the surface of the base panel member, the coordinate electrodes constitut-



ing the corresponding locations or positions of key coordinates and each of the electrodes comprising a combination of a pair of an input electrode and an output electrode;

5 the input electrode and the output electrode being both of a substantially transparent or translucent material; and

10 surface layer disposed on the surfaces of both the coordinate electrodes and the base panel member with the exterior surface thereof kept open and the other surface thereof adhered thereto, the surface layer being of a substantially transparent or translucent dielectric material;

15 the key board panel being substantially transparent or translucent to see through data to be disposed or placed thereunder; and the coordinate electrodes being constructed such that the respective pairs of the input electrodes and the output electrodes constituting the corresponding coordinate electrodes are arranged so as to be capacitively coupled to each other through a separate conductive element.

25 2. The capacitive key input unit according to Claim 1, wherein a shield electrode is arranged between the pair of the input electrode and the output electrode and the shield electrode is of a substantially transparent and translucent material.

30 3. The capacitive key input unit according to Claim 1 or 2, wherein the input and output electrodes and/or the shield electrode are of a metal oxide including indium oxide-tin oxide or tin oxide-antimony oxide.

35 4. The capacitive key input unit according to any one of Claims 1 to 3, wherein the surface layer is of a substantially transparent or translucent soft material.

40 5. The capacitive key input unit according to Claim 4, wherein the soft material is a polymer material including a polyolefin, polyester, polyvinyl chloride, a fluorine-containing resin or a rubber.

45 6. The capacitive key input unit according to any one of Claims 1 to 5, wherein the base panel member is of a hard material.

50 7. The capacitive key input unit according to Claim 6, wherein the hard material is an acrylic resin or glass.

8. The capacitive key input unit according to any one of Claims 1 to 5, wherein the base panel member is of a substantially transparent or translucent soft material.

55 9. The capacitive key input unit according to Claim 8, wherein the soft material is a polymer material including a polyolefin, polyester, polyvinyl chloride, a fluorine-containing resin or a rubber.

60 10. The capacitive key input unit according to any one of Claims 1 to 9, wherein the surface layer has a thickness ranging from about 1 to 30 microns and, preferably, from about 2 to 20 microns.

65 11. The capacitive key input unit accord-

ing to any one of Claims 1 to 9, wherein at least one of the surface layer, the coordinate electrodes and the base panel member is provided with a mark or marks for indicating or representing the corresponding locations or positions of the key coordinates.

70 12. The capacitive key input unit according to Claim 11, wherein the mark comprises lines for indication or representation arranged 75 in squares such that each of the square divisions corresponds to each of the key coordinates, subdivisions arranged within the square divisions so as to correspond to each of the key coordinates or underlines arranged so as 80 to indicate or represent each of the corresponding key coordinates.

13. The capacitive key input unit according to any one of Claims 1 to 11, wherein locations or positions of the key board panel 85 corresponding to the key coordinates are colored in pale or faint color.

14. The capacitive key input unit according to Claim 1, wherein the input electrodes arranged side by side or one behind another 90 in series in a row or line are connected electrically to a common input signal line and the output electrodes arranged side by side or one behind another in series in a row or line are connected electrically to a common output 95 signal line.

15. The capacitive key input unit according to Claim 14, wherein the input electrode and the output electrodes are arranged such that the input electrodes located side by side 100 in a row are connected electrically to the common input signal line while the output electrodes located one behind another in a column corresponding to each of the input electrodes are connected electrically to the 105 common output signal line and vice versa.

16. A method of operating the capacitive key input unit as claimed in any one of Claims 1 to 15, which comprises the steps of:

110 placing or inserting a data indicating means under the key board panel so as to correspond the key coordinates of the key board panel to the respective data of the data indicating means; and

bringing a separate conductive body closer 115 to or into contact with each of the key coordinates corresponding to the surface of the surface layer so as to capacitively couple the respective input electrode to the respective output electrode.

120 17. The method according to Claim 16, wherein the data indicating means is a sheet of a data card having a size corresponding to the key board panel.

18. The method according to Claim 16 or 125 17, wherein the separate conductive body is an operational rod with at least its tip portion being conductive.

19. The method according to Claim 18, wherein the operational rod comprises an insulative cylindrical body, an elastic body pro-



vided on one of the end portions thereof, and a conductive layer provided on the surface of the end portion thereof.

20. The method according to Claim 19,  
5 wherein the elastic body is of a foam.

21. A capacitive key input unit substantially as described with reference either to Figs. 1 and 2 or to Fig. 3 of the accompanying drawings.

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